

## **AMENDMENTS TO THE CLAIMS**

1-7. (Cancelled)

8. (Currently Amended) A method, comprising:

populating entries within a conversion table to map virtual addresses of a memory range allocated to a graphics controller to physical addresses within main memory, wherein the physical addresses have a greater number of bits than the virtual addresses to enable paging to off-chip components for access to the main memory above a physical address range limit imposed by a register/bus width;

using the conversion table to translate a virtual address from the graphics controller to a first physical address for access to the main memory; and

using the conversion table to translate a virtual address from a bus controller to a second physical address for access to the main memory;

wherein the second physical address has a greater number of bits than the virtual address from the graphics controller and the second physical address has a greater number of bits than the virtual address from the bus controller.

9. (Previously Presented) The method of claim 8, wherein said using the conversion table to translate the virtual address from the bus controller comprises using a translation lookaside buffer.

10-11. (Cancelled)

12. (Previously Presented) The method of claim 8, wherein said using the conversion table to translate the virtual address from the bus controller comprises:

comparing a first portion of the virtual address from the bus controller with entries in a first table;

if the first portion matches a particular one of the entries in the first table, combining a value associated with the particular one with a second portion of the virtual address from the bus controller to form the fourth address.

13. (Previously Presented) The method of claim 12, further comprising:  
if the first portion does not match any of the entries in the first table, referring to a second table to translate the virtual address from the bus controller.

14. (Previously Presented) The method of claim 13, wherein:  
said comparing comprises comparing the first portion of the virtual address from the bus controller with entries in the first table in an input-output controller; and  
said referring to the second table comprises referring to the second table in main memory.

15. (Currently Amended) An apparatus, comprising:  
a translation lookaside buffer coupled to an input register and an output register;  
control logic coupled to the translation lookaside buffer, the input register, and the output register, the control logic to populate entries within the translation lookaside buffer to map virtual addresses of a memory range allocated to a graphics controller to physical addresses within main memory, wherein the physical addresses have a greater number of bits than the virtual addresses to enable paging to off-chip components for access to the main memory above a physical address range limit imposed by a register/bus width;

wherein the control logic is to compare a first portion of virtual address from a bus controller in the input register with the entries in the translation lookaside buffer; and if a matching entry is found, to combine a first value associated with the matching entry with a second portion of the virtual address to form a first translated physical address having a greater number of bits than the virtual address and hold the first translated physical address in the output register;

wherein the control logic is further to access a table in the main memory if the matching entry is not found, find a second value in the table associated with the first portion, combine the second value with the second portion to form a second translated physical address having a greater number of bits than the virtual address, and hold the second translated address in the output register.

16. (Cancelled)

17. (Previously Presented) The apparatus of claim 15, wherein:  
the control logic includes logic for first and second control flows;  
the second control flow is to translate a virtual graphics controller address and does not access the second table; and  
the first control flow is to translate a virtual bus controller address and access the second table.

18. (Cancelled)

19. (Currently Amended) A system, including:  
a processor;  
a main memory;  
a graphics controller;  
a bus controller;  
an input-output controller coupled to the processor, memory, graphics controller and bus controller, the input-output controller including:  
a translation lookaside buffer coupled to an input register and an output register;  
control logic coupled to the translation lookaside buffer, the input register, and the output register, the control logic to populate entries within the translation lookaside buffer to map virtual addresses of a memory range allocated to the graphics controller to physical addresses within the main memory, wherein the physical addresses have a greater number of bits than the virtual addresses to enable paging to off-chip components for access to the main memory above a physical address range limit imposed by a register/bus width;  
wherein the control logic is to compare a first portion of a first virtual address from the bus controller in the input register with entries in the translation lookaside buffer; and if a first matching entry is found, to combine a first value associated with the first matching entry with a second portion of the first virtual address to form a first translated physical address having more bits than the first virtual address and hold the first translated physical address in the output register;

wherein the control logic is further to compare a first portion of a second virtual address from the graphics controller in the input register with the entries in the translation lookaside buffer; and if a second matching entry is found, to combine a second value associated with the second matching entry with a second portion of the second virtual address to form a second translated physical address having more bits than the second virtual address and hold the second translated address physical in the output register.

20. (Previously Presented) The system of claim 19, wherein the control logic is further to:

access a table in memory if the first matching entry is not found;  
find a third value in the table associated with the first portion of the first virtual address;  
combine the third value with the second portion of the first virtual address to form a third translated physical address; and  
hold the third translated address in the output register.

21. (Previously Presented) The system of claim 20, wherein:  
the control logic comprises logic for first and second control flows;  
the second control flow is to translate a virtual graphics controller address and does not access the table; and  
the first control flow is to translate a virtual bus controller address and access the table.

22.-29. (Cancelled)

30. (Currently Amended) An apparatus comprising:  
an address translator including a translation lookaside buffer and having a first interface to couple to a memory controller, a second interface to couple to a graphics controller, a third interface to couple to a bus controller, and a table of entries, each entry having a first portion and a second portion;  
a translation control circuit coupled to the address translator to program entries in the translation lookaside buffer to map virtual addresses of a memory range allocated to the graphics controller to physical addresses within the main memory, wherein the physical addresses have a

greater number of bits than the virtual addresses to enable paging to off-chip components for access to the main memory above a physical address range limit imposed by a register/bus width;

wherein the address translator is to translate a virtual address on the third interface into a first physical address on the first interface having a greater number of bits than the virtual address on the third interface.

31. (Previously Presented) The apparatus of claim 30, wherein:

the address translator is further to translate a virtual address on the second interface into a second physical address on the first interface having a greater number of bits than the virtual address on the second interface.

32. (Previously Presented) The apparatus of claim 30, wherein:

the address translator comprises a graphics translation lookaside buffer.